

## **Application of a 3D freehand ultrasound system for the measurement of lumbar multifidus volume: protocol of a reliability study.**

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**Introduction** 3D freehand ultrasonography (3DfUS) can be used to measure muscle and tendon morphological and structural properties, including volume, length and echo-intensity. Its reliability has been already demonstrated for lower limb muscles<sup>1</sup>. 3DfUS might be an interesting tool for the evaluation of other muscles, such as the lumbar multifidus of which structural dysfunction might play a role in chronic low back pain (CLBP). Instead of using 2D ultrasound measures such as cross-sectional area and thickness, volume measurements might be a better reflection of muscle size. However, the reliability of measuring the lumbar multifidus muscle volume by 3DfUS remains unknown in individuals with CLBP.

**Aim** To determine inter- and intra-rater reliability of acquisition and processing of lumbar multifidus muscle volume measurements by 3DfUS in patients with CLBP.

**Methods** Lumbar multifidus muscles will be visualized bilaterally from L2 to S1 using a 3DfUS system, consisting of a conventional 2D US system and a motion-tracking system. The US images will be manually segmented and interpolated for the calculation of muscle volume by Stradwin software. Thirty patients with CLBP will be evaluated at rest in a prone position. Data acquisition will be performed three times by two examiners in two separate sessions. Intraclass correlation coefficients with 95% confidence interval and the standard error of measurement will be calculated within and between examiners.

**Results** Data collection is going on and an analysis of the results will be presented.

**Conclusion** Inter- and intra-rater acquisition and processing reliability of lumbar multifidus muscle volume measured by 3DfUS will be determined in patients with CLBP.

**Keywords** Muscle volume, ultrasound, low back muscles, reliability

1. Cenni F, Schless S-H, Bar-On L, Aertbeliën E, Bruyninckx H, Hanssen B, et al. Reliability of a clinical 3D freehand ultrasound technique: Analyses on healthy and pathological muscles. *Comput. Methods Programs Biomed.* 2018;156:97–103.